Isolation Verification of HINS Meson Power RF Distribution Components

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This document summarizes the measurements made on the HINS Meson power RF distribution system that verify the isolation of different devices. The devices tested include the waveguide and coaxial switch, the waveguide shutter, and the waveguide circulator.

For the coaxial switch and shutter test, a CW 325 MHz RF signal is input into the waveguide system and sensed at the output of the coaxial switch. The configuration is shown below. Both the shutter and switch positions are changed to compare power levels for through signals and isolated signals. The results are shown in Figures 2 and 3.

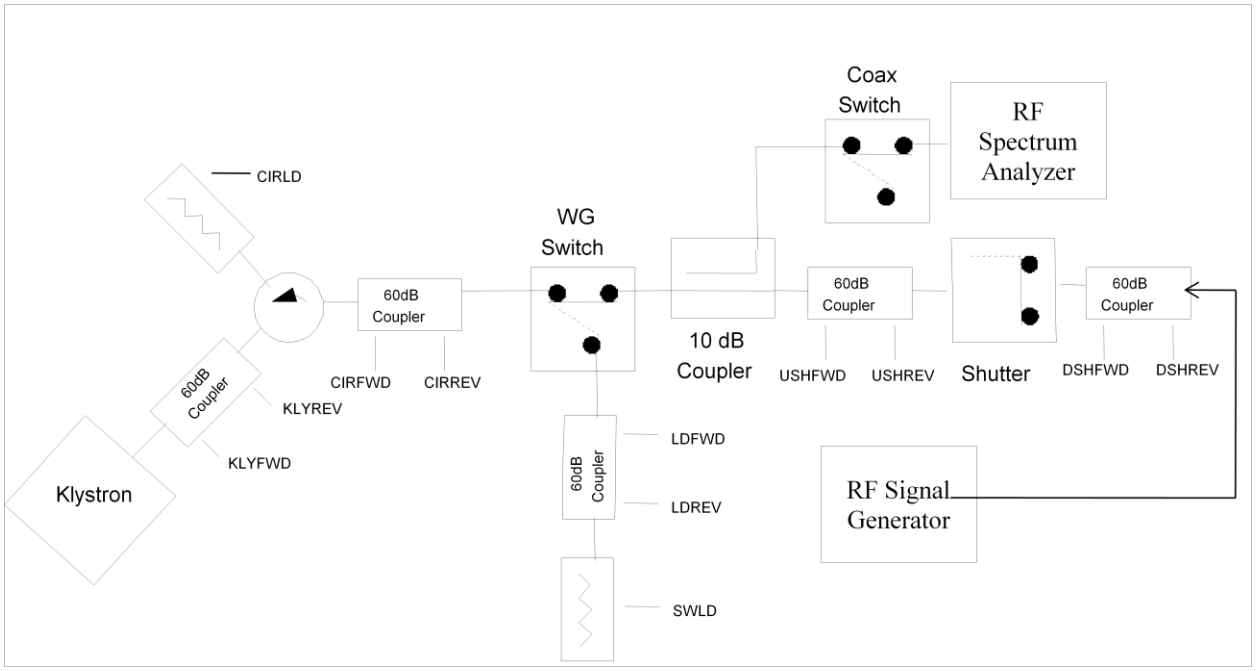

Figure 1: Test setup for measuring isolation of coaxial switch and waveguide shutter.

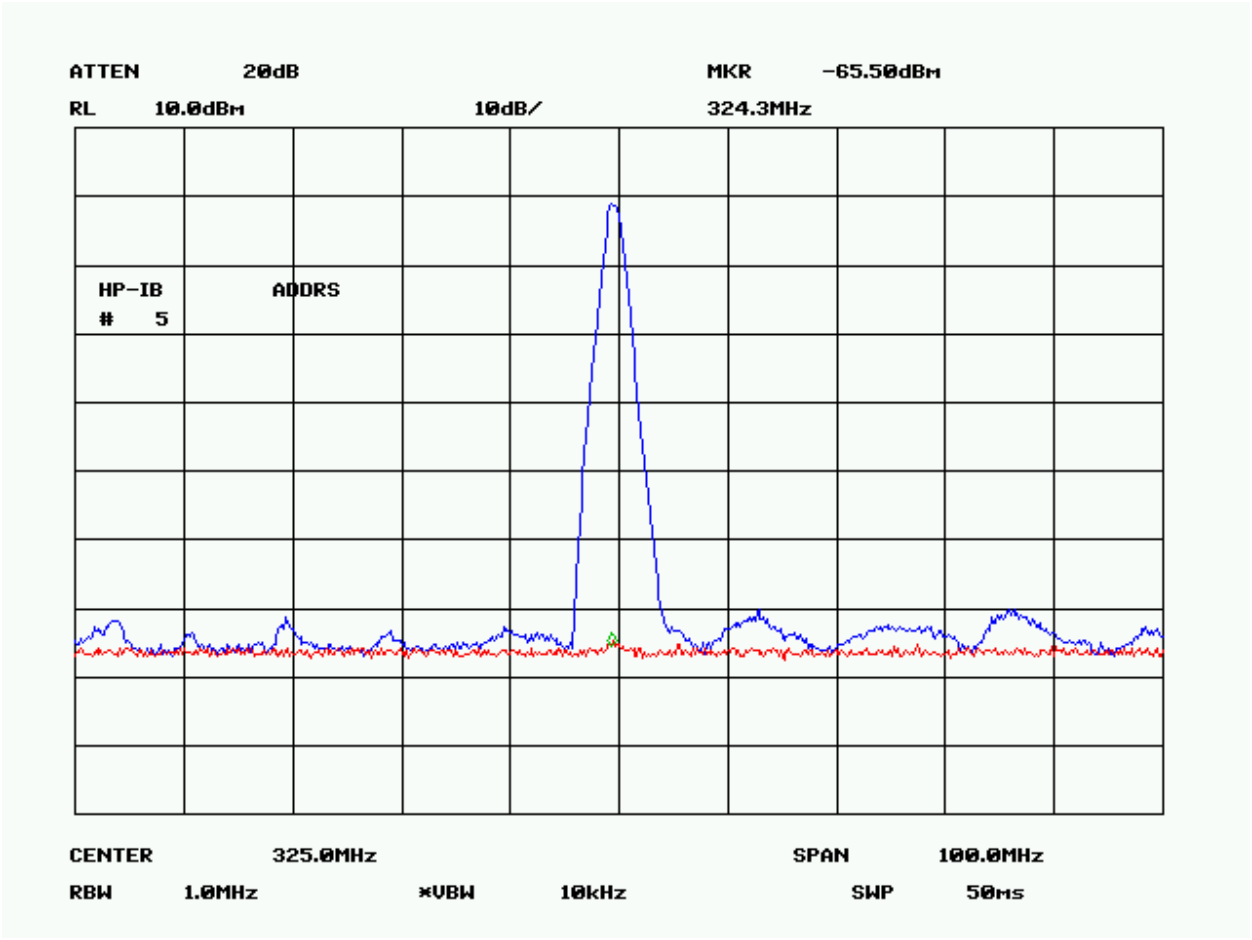

Figure 2: Isolation of coaxial switch. Blue trace is with switch set to test cave position. Red trace is with swich set to termination. Isolation is about 65 dB.

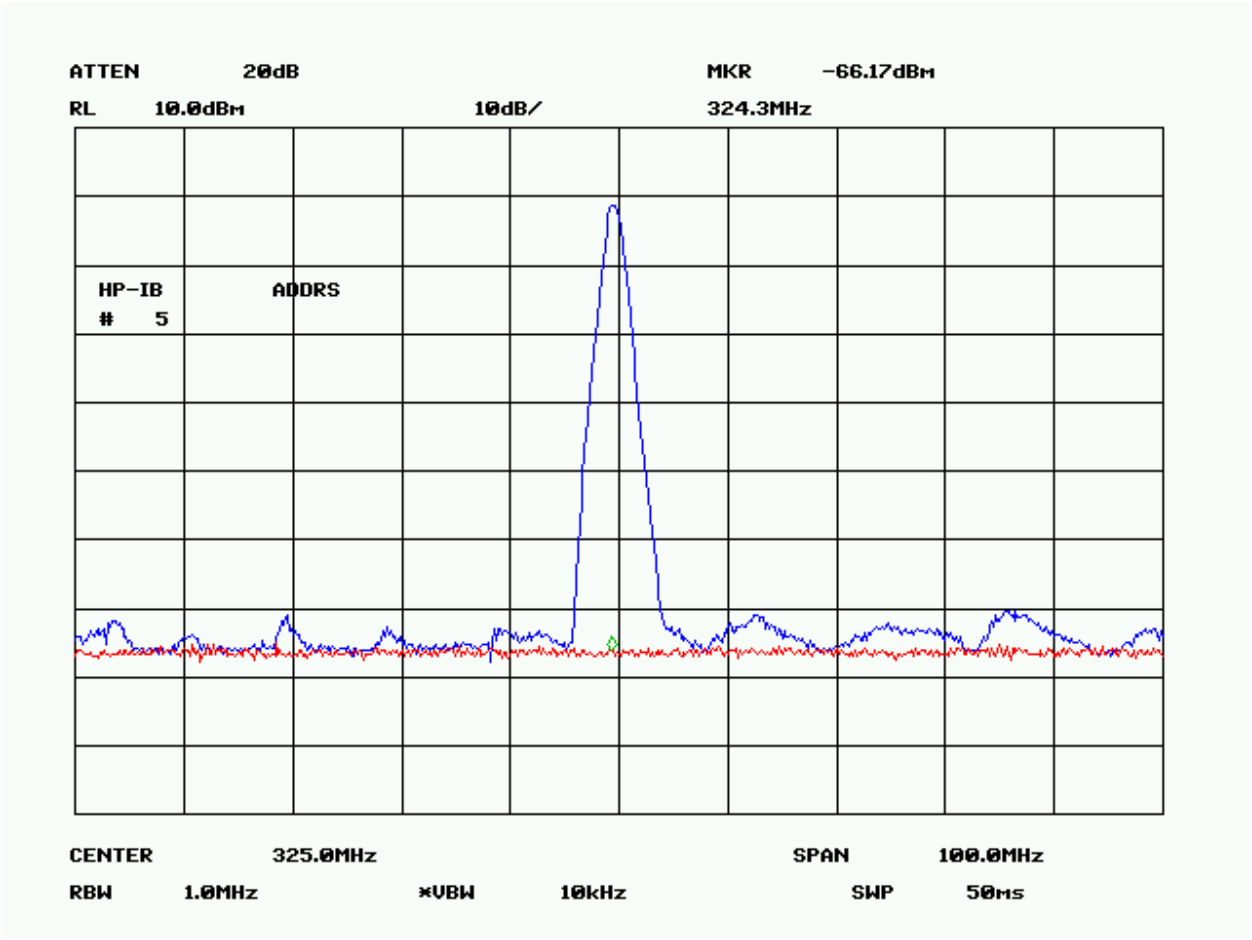

Figure 3: Waveguide shutter isolation measurements. Blue trace is with shutter open and red trace is with shutter closed. Isolation is better that 65 dB.

There is no direct connection to the waveguide distribution around the waveguide switch and circulator. The properties of these components must be verified using the local couplers. These couplers are 60dB couplers, so a fairly substantial RF power supply is needed to see any significant signals out of these couplers. An 800W pulsed RF power amplifier is used as the source for the measurements of the waveguide switch and circulator properties. The spectrum analyzer is set to zero span and triggered in conjunction with the pulse trigger for the amplifier. The following plots show the results.

For each of the following plots, the power amplifier was configured to output 20W of power for a 1ms pulse at a 10Hz rep rate. Figure 4 shows that the switch isolation is at least 40dB and is probably better, but we are at the limit of the analyzer's dynamic range. Figure 5 shows the difference between reverse power entering the circulator and reverse power entering the klystron. This shows that the circulator system isolates the klystron from reflected power by about 30dB.

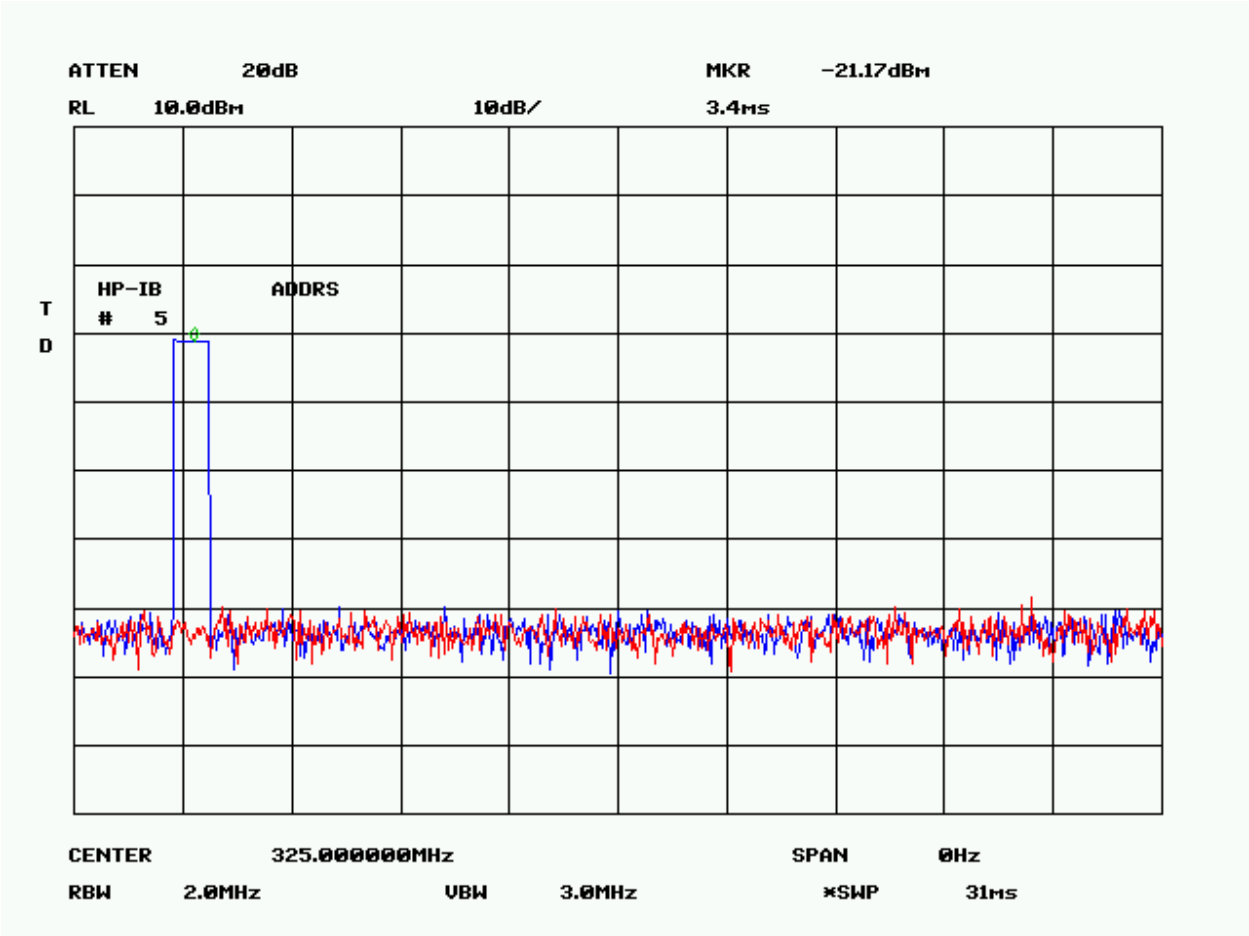

Figure 4: Verification of the waveguide switch isolation. Both traces are measurements of the power from CIRREV, the circulator reflected power. The blue trace shows the power with the switch in the component test position, red in the load position.

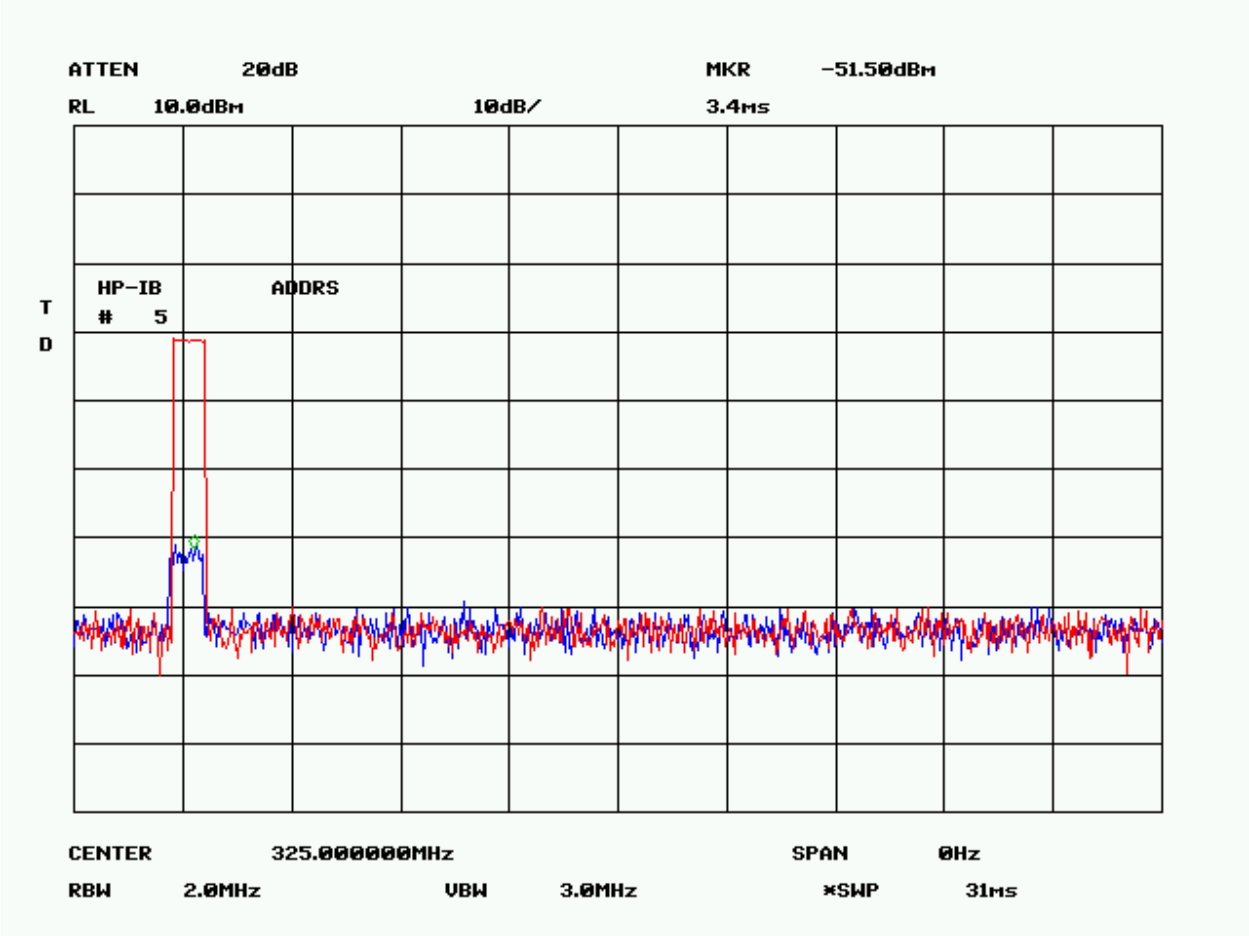

Figure 5: Measurement of the circulator isolation. Red trace is CIRREV and blue trace is KLYREV with the same conditions.